

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

RAINANCE TECHNOLOGIES, INC., and
THE UNIVERSITY OF CHICAGO,

Plaintiffs,

v.

10X GENOMICS, INC.

Defendant.

Civil Action No. 1:15-cv-00152-RGA

MEMORANDUM OPINION

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ANDREWS, U.S. DISTRICT JUDGE:

Presently before the Court is the issue of claim construction of multiple terms in U.S. Patent Nos. 7,129,091 (“the ’091 patent”), 8,822,148 (“the ’148 patent”), 8,329,407 (“the ’407 patent”), 8,304,193 (“the ’193 patent”), 8,658,430 (“the ’430 patent”), and 8,889,083 (“the ’083 patent”). The Court has considered the Parties’ Joint Claim Construction Brief. (Civ. Act. No. 15-152-RGA, D.I. 93). The Court heard oral argument on December 16, 2016. (D.I. 105) (Hr’g Tr.).

I. BACKGROUND

Plaintiffs filed this action on February 12, 2015, alleging infringement of six patents on behalf of both Plaintiffs. (D.I. 1). Plaintiffs refer to these patents as the Ismagilov patents. On April 23, 2015, Plaintiffs filed an amended complaint asserting an additional patent, the ’430 patent, on behalf of Plaintiff RainDance only. (D.I. 12). On March 25, 2016, Plaintiffs filed a second amended complaint in which they asserted only five of the Ismagilov patents, leaving six patents currently in suit as listed above. (D.I. 32).

II. LEGAL STANDARD

“It is a bedrock principle of patent law that the claims of a patent define the invention to which the patentee is entitled the right to exclude.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (internal quotation marks omitted). “[T]here is no magic formula or catechism for conducting claim construction.’ Instead, the court is free to attach the appropriate weight to appropriate sources ‘in light of the statutes and policies that inform patent law.’” *SoftView LLC v. Apple Inc.*, 2013 WL 4758195, at *1 (D. Del. Sept. 4, 2013) (quoting *Phillips*, 415 F.3d at 1324) (alteration in original). When construing patent claims, a court considers the literal language of the claim, the patent specification, and the prosecution history. *Markman v.*

Westview Instruments, Inc., 52 F.3d 967, 977–80 (Fed. Cir. 1995) (en banc), *aff'd*, 517 U.S. 370 (1996). Of these sources, “the specification is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.” *Phillips*, 415 F.3d at 1315 (internal quotation marks omitted).

“[T]he words of a claim are generally given their ordinary and customary meaning. . . . [Which is] the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application.” *Id.* at 1312–13 (citations and internal quotation marks omitted). “[T]he ordinary meaning of a claim term is its meaning to [an] ordinary artisan after reading the entire patent.” *Id.* at 1321 (internal quotation marks omitted). “In some cases, the ordinary meaning of claim language as understood by a person of skill in the art may be readily apparent even to lay judges, and claim construction in such cases involves little more than the application of the widely accepted meaning of commonly understood words.” *Id.* at 1314.

When a court relies solely upon the intrinsic evidence—the patent claims, the specification, and the prosecution history—the court’s construction is a determination of law. *See Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 135 S. Ct. 831, 841 (2015). The court may also make factual findings based upon consideration of extrinsic evidence, which “consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises.” *Phillips*, 415 F.3d at 1317–19 (internal quotation marks omitted). Extrinsic evidence may assist the court in understanding the underlying technology, the meaning of terms to one skilled in the art, and how the invention works. *Id.* Extrinsic evidence, however, is less reliable and less useful in claim construction than the patent and its prosecution history. *Id.*

“A claim construction is persuasive, not because it follows a certain rule, but because it defines terms in the context of the whole patent.” *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998). It follows that “a claim interpretation that would exclude the inventor’s device is rarely the correct interpretation.” *Osram GMBH v. Int’l Trade Comm’n*, 505 F.3d 1351, 1358 (Fed. Cir. 2007) (citation and internal quotation marks omitted).

III. CONSTRUCTION OF DISPUTED TERMS

A. The Patents-In-Suit

The ’091 patent is directed to a device and method for pressure-driven plug transport and reaction. Claim 1 is representative and reads as follows:

1. A method of conducting a *reaction* within at least one plug comprising the steps of:
 - introducing a carrier-fluid into a first microchannel of a device;
 - simultaneously introducing at least two streams of plug-fluids into a first inlet in fluid communication with the first microchannel so that at least one plug forms in the carrier-fluid after the streams contact the carrier-fluid; wherein:
 - a first plug-fluid comprises a first *reagent*;
 - a second plug-fluid comprises a second *reagent*;
 - each* plug-fluid is immiscible with the carrier-fluid; and
 - each* plug comprises both the first and second plug-fluids so that the *reaction* of the *reagents* substantially occurs in the plug;
 - each* plug is substantially surrounded by carrier.

(’091 patent, claim 1) (disputed terms italicized).

The ’193 patent is directed to a method for conducting an autocatalytic reaction in plugs in a microfluidic system. Claim 1 is representative and reads as follows:

1. *A method for conducting an autocatalytic reaction in plugs in a microfluidic system*, comprising the steps of:
 - providing the *microfluidic system* comprising at least two channels having at least one junction;
 - flowing an aqueous fluid containing at least one substrate molecule and *reagents* for conducting an autocatalytic *reaction* through a first channel of the at least two channels;
 - flowing an oil through the second channel of the at least two channels;

forming at least one plug of the aqueous fluid containing the at least one substrate molecule and *reagents* by partitioning the aqueous fluid with the flowing oil at the junction of the at least two channels, the plug being substantially surrounded by an oil flowing through the channel, wherein the at least one plug comprises at least one substrate molecule and *reagents* for conducting an autocatalytic *reaction* with the at least one substrate molecule; and

providing conditions suitable for the autocatalytic reaction in the at least one plug such that the at least one substrate molecule is amplified.

('193 patent, claim 1) (disputed terms italicized).

The '407 patent is directed to a method for conducting reactions involving biological molecules in plugs in a microfluidic system. Claim 1 is representative and reads as follows:

1. *A method for conducting a reaction in plugs in a microfluidic system*, comprising the steps of:

providing the *microfluidic system* comprising at least two channels having at least one junction;

continuously flowing an aqueous fluid containing at least one *biological molecule* and at least one *reagent* for conducting the *reaction* between the *biological molecule* and the at least one *reagent* through a first channel of the at least two channels;

continuously flowing a carrier fluid immiscible with the aqueous fluid through the second channel of the at least two channels;

forming at least one plug of the aqueous fluid containing the at least one *biological molecule* and the at least one *reagent* by partitioning the aqueous fluid with the flowing immiscible carrier fluid at the junction of the at least two channels, the plug being substantially surrounded by the immiscible carrier fluid flowing through the channel, wherein the at least one plug comprises at least one *biological molecule* and the at least one *reagent* for conducting the *reaction* with the at least one *biological molecule*; and

providing conditions suitable for the reaction in the at least one plug involving the at least one *biological molecule* and the at least one *reagent* to form a *reaction product*.

('407 patent, claim 1) (disputed terms italicized).

The '148 patent is directed to a method of performing PCR reactions in continuously flowing microfluidic plugs. Claim 1 is representative and reads as follows:

1. A method comprising the steps of:

providing a *microfluidic system* comprising one or more channels;

providing within the one or more channels a continuously flowing carrier fluid comprising an oil and a continuously flowing aqueous fluid comprising target

DNA or RNA molecules and at least one other molecule in the fluid that can react with the target DNA or RNA molecules under conditions in which the target DNA or RNA molecules and the other molecules in the fluid do not react with each other;

controlling flow rates of said aqueous fluid and said carrier fluid to partition the continuously flowing aqueous fluid with the continuously flowing carrier fluid to form a plurality of plugs of the aqueous fluid, each having a substantially uniform size of about 200 μm or less, wherein the target DNA or RNA in said plurality of plugs represents a *Poisson distribution*, and at least one member of said plurality comprises a *single target DNA or RNA molecule* and at least one of the other molecules that can react with the target DNA or RNA molecule; and

providing conditions suitable for a polymerase-chain reaction in at least one plug of the plurality of plugs such that the target DNA or RNA is amplified.

('148 patent, claim 1) (disputed terms italicized).

The '083 patent is directed to a device and method for pressure-driven plug transport and reactions. Claim 1 is representative and reads as follows:

1. A *microfluidic system* comprising:
 - a *non-fluorinated microchannel*;
 - a carrier fluid comprising a fluorinated oil and a fluorinated surfactant comprising a hydrophilic head group in the microchannel;
 - at least one plug comprising an aqueous plug-fluid in the microchannel and substantially encased by the carrier-fluid, wherein the fluorinated surfactant is present at a concentration such that surface tension at the plug-fluid/microchannel wall interface is higher than surface tension at the plug-fluid/carrier fluid interface.

('083 patent, claim 1) (disputed terms italicized).

The '430 patent is directed to manipulating droplet size. Claim 1 is representative and reads as follows:

1. A method for droplet formation, the method comprising the steps of:
 - providing a plurality of aqueous fluids each in its own aqueous fluid channel in fluid communication with one or more immiscible carrier fluid channels;
 - forming droplets of aqueous fluid surrounded by an immiscible carrier fluid in the aqueous fluid channels;
 - applying a same constant pressure to the carrier fluid in each of the immiscible carrier fluid channels; and
 - adjusting pressure in one or more of the aqueous fluid channels, *thereby* to produce droplets of aqueous fluid in one or more outlet fluid channels.

('430 patent, claim 1) (disputed terms italicized).

B. Disputed Terms

1. “microfluidic system”

- a. *Plaintiffs’ proposed construction*: “‘microfluidics’ refers to a field that involves the transport of fluids through networks of channels, typically having micrometer dimensions”
- b. *Defendant’s proposed construction*: “a substrate involving the transport of fluids through a network of channels having micrometer dimensions, *i.e.*, lab-on-a-chip”
- c. *Court’s construction*: “system comprised of at least one substrate having a network of channels of micrometer dimension through which fluid may be transported”

This term appears in asserted claims in the ’193, ’148, ’083, and ’407 patents. Defendant wishes to limit a “microfluidic system” to the substrate. Defendant contends that the patent describes the microfluidic system as a “lab-on-a-chip” which is a “physical object” that is referred to as a “substrate” throughout the specification. (D.I. 93 at 27). As support, Defendant points to the abstract, which states, “The present invention provides microfabricated substrates and methods of conducting reactions within these substrates.” (*Id.*; ’014 patent at Abstract). Plaintiffs counter that the systems are only “sometimes called labs-on-a-chip” and reference descriptions of the system in the specification that include components that are not on the chip. (D.I. 93 at 15).

As an initial matter, I find Defendant’s reliance on the abstract to be misplaced. The words “microfluidic system” do not appear in the abstract. (’148 patent at Abstract). Furthermore, the fact that the invention is said to “provide” substrates does not imply that the inventor intended “substrate” to be a synonym for “microfluidic system.”

It seems clear to me that the inventor used the word “system” to mean something different from the words “device” and “substrate.” Substrate is defined in the specification as “a layer or piece of material from which devices or chips are prepared or manufactured.” (*Id.* at 11:13-14). The specification further provides that substrate “refers either to an entire device or chip or to a

portion, area, or section of a device or chip.” (*Id.* at 11:17-19). In addition, “[a] device according to the invention preferably comprises at least one substrate.” (*Id.* at 14:28-29). The specification, in describing one use of the invention, provides that “these devices and methods may be used to build microfluidic systems according to the invention.” (*Id.* at 51:16-17). In other words, devices are manufactured from one or more substrates and devices are used to build microfluidic systems. This indicates that the term “microfluidic system” is intended to mean something broader than the term “substrate.” There are numerous other examples throughout the specification demonstrating that the inventor intended “system” to be broader than “substrate.” For example, the specification describes synthesis of certain compounds in reference to the substrate (*Id.* at 47:57-58), but references the system when describing crystallization. (*Id.* at 50:24-26).

Given this abundant evidence in the specification, the fact that the inventor chose to claim a “microfluidic system” rather than a “substrate,” a term the inventor chose to expressly define, indicates that the invention as claimed is broader than what Defendant proposes. Therefore, I will reject Defendant’s proposal. Plaintiffs’ proposed construction, however, is useless, as it does not define “microfluidic system”; rather, Plaintiffs have proposed a definition of the field of microfluidics in general. Therefore, I will reject Plaintiffs’ proposal as well. Instead, I will construe “microfluidic system” to mean “system comprised of at least one substrate having a network of channels of micrometer dimension through which fluid may be transported.” Defendant is prohibited from arguing that a “microfluidic system” is limited to or the equivalent of a “substrate.”

2. “reagent”

- a. *Plaintiffs’ proposed construction:* “A component of a plug-fluid that undergoes or participates in at least one type of reaction.”

- b. *Defendant's proposed construction*: "component of a plug-fluid that undergoes or participates in at least one type of reaction in the substrate to produce one or more reaction products or intermediates which may undergo a further reaction or series of reactions"
- c. *Court's construction*: "component of a plug-fluid that undergoes or participates in at least one type of reaction to produce one or more reaction products or intermediates which may undergo a further reaction or series of reactions"

This term appears in asserted claims in the '193, '091, '083, and '407 patents. This term is expressly defined in the specification of the various patents. ('091 patent at 10:60-11:7). The only point of dispute is whether the reaction the reagent undergoes must occur in the substrate. Defendant insists that the definition from the specification requires the reaction occur in the substrate. (D.I. 93 at 18). The specification states:

The term "reagent" refers to a component of a plug-fluid that undergoes or participates (e.g., by influencing the rate of a reaction or position of equilibrium) in at least one type of reaction with *one or more components of other plug-fluids or a reagent-containing carrier-fluid* in the substrate to produce one or more reaction products or intermediates which may undergo a further reaction or series of reactions.

('091 patent at 10:60-66) (emphasis added). Defendant argues that the phrase "in the substrate" modifies both of the italicized phrases in the quote above; in other words, Defendant believes "in the substrate" modifies, and provides the location for, the "reaction." (D.I. 93 at 18). Defendant contends that it has merely "simplifie[d] some of the wording, while maintaining its core language." (*Id.*). I disagree. A more natural reading of this sentence is one in which "in the substrate" modifies only "a reagent-containing carrier-fluid." Had the intent been to limit the location of all reactions in the way Defendant's propose, the sentence would more logically be written as, "at least one type of reaction in the substrate with . . ." This, in fact, is precisely the effect of Defendant's "simplification."

Furthermore, as Plaintiffs point out, “The carrier fluid is the medium that carries the plug down a microfluidic channel.” (*Id.* at 33). It makes sense, then, that a reaction involving the carrier fluid would necessarily take place in the substrate. In contrast, I find nothing in the specification or claims that limits the location of reactions involving plug-fluids to the substrate. For these reasons, I will reject Defendant’s proposed construction to the extent that it limits the location of the reaction. I construe “reagent” to mean “component of a plug-fluid that undergoes or participates in at least one type of reaction to produce one or more reaction products or intermediates which may undergo a further reaction or series of reactions.”

3. “reaction”

- a. *Plaintiffs’ proposed construction*: “No construction necessary, but if construed ‘a physical, chemical, biochemical or biological transformation’”
- b. *Defendant’s proposed construction*: “a physical, chemical, biochemical or biological transformation that substantially occurs on a substrate”
- c. *Court’s construction*: “physical, chemical, biochemical or biological transformation”

This term appears in asserted claims in the ’193, ’148, ’083, ’091, and ’407 patents. As with the previous term, this term is expressly defined in the specifications of the patents and the only dispute is again about whether to impose a limitation on the location of the reaction.

As an initial matter, I note that the definition in the specification does not mention the substrate or otherwise limit the location of the reaction. Defendant cites extensively to the descriptions of certain embodiments to argue that the only place a reaction may occur in this invention as claimed is on a substrate. (D.I. 93 at 19-23). Plaintiffs counter that the specification discloses at least one type of reaction, crystallization, which, in certain embodiments, occurs off-chip. (*Id.* at 16-17). Defendant attempts to rebut this argument by pointing to a restriction requirement imposed by the examiner during prosecution of the patent (D.I. 95-3 at 268) directing

the inventor to elect either the “method of conducting a reaction” or the “method of crystallizing a substance.” (D.I. 93 at 44). Defendant argues that because crystallization and conducting a reaction are distinct inventions, Plaintiffs’ reliance on crystallization to show that a reaction may occur off-chip is misplaced. (D.I. 93 at 44).

I do not find the restriction requirement to be a persuasive reason to narrow the construction of this term. “[A] patent applicant’s response to a restriction requirement may be used to interpret patent claim terms or as a source of disclaimer.” *Uship Intellectual Properties, LLC v. United States*, 714 F.3d 1311, 1315 (Fed. Cir. 2013). The applicant’s response must, however, “constitute[] a clear and unmistakable disclaimer of claim scope.” *Id.* Here, the applicant’s response was to elect one of the inventions, “[f]or examination purposes only.” (D.I. 95-3 at 272). Neither the examiner nor the applicant addressed whether crystallization is a reaction, which is the point of dispute between the parties. Furthermore, even accepting that crystallization is sufficiently distinct from other types of reactions so as to justify the restriction requirement, this does not mean that crystallization is not itself a reaction. In fact, the specification clearly defines “reaction” to include crystallization. (’091 patent at 10:49-59). Therefore, I find no support for limiting the location where “reactions” occur to the substrate and I will adopt Plaintiffs’ proposed construction.

4. “providing conditions suitable for [the autocatalytic reaction/the reaction/a polymerase-chain reaction]”

- a. *Plaintiffs’ proposed construction*: “Providing a set of physical and chemical conditions that allow the [autocatalytic reaction/reaction/polymerase-chain reaction] to occur”
- b. *Defendant’s proposed construction*: “requiring a global set of physical and chemical conditions that allow the [autocatalytic reaction/reaction/polymerase-chain reaction] to occur in plugs on a substrate”

- c. *Court's construction*: "Providing a set of physical and chemical conditions that allow the [autocatalytic reaction/reaction/polymerase-chain reaction] to occur."

These terms appears in asserted claims in the '193, '148, and '407 patents. As an initial matter, Defendant has made no argument regarding the phrase "requiring a global set" of conditions. It is unclear to me what Defendant intends to convey by "global set." Since this only adds unnecessary confusion to the meaning of this term, I will reject Defendant's proposed construction. Aside from this, the only dispute between the parties (and the only thing the parties argued) is whether the reactions must occur on a substrate. For the reasons stated above in my construction of "reaction," I reject Defendant's proposed limitation and adopt Plaintiffs' construction.

5. "detecting"

- a. *Plaintiffs' proposed construction*: "No construction necessary."
- b. *Defendant's proposed construction*: "'detecting refers to detecting in the detection region'"
- c. *Court's construction*: "No construction necessary."

This term appears in asserted dependent claims of the '091 patent. Defendant argues that the term must be construed with reference to a detector or detection region, terms that are defined within the specification. (D.I. 93 at 48-49). In other words, Defendant does not actually offer a construction, but seeks to limit the meaning of the term to restrict where "detecting" may occur. This limitation is not supported by the intrinsic evidence. While the specification offers an express definition for "detection region," there is no express definition for "detecting," nor is "detecting" used in the definition of "detection region." ('091 patent at 7:61-64). Furthermore, the claims at issue do not mention a detection region. Claim 22, for example, calls for "detecting the presence of at least one plug." The specification indicates that, at least sometimes, detection occurs after

the plugs leave the substrate. ('091 patent at 33:64-66). It seems to me that while “detecting” may occur in the detection region, there is nothing in the patent that limits “detecting” in this way. Therefore, I reject Defendant’s proposed construction and find that no construction is necessary for this term. Defendant is prohibited from arguing that detecting must occur in a detection region.

6. “A method for conducting an autocatalytic reaction in plugs in a microfluidic system”/“A method for conducting a reaction in plugs in a microfluidic system”

- a. *Plaintiffs’ proposed construction*: “Preamble is not limiting.”
- b. *Defendant’s proposed construction*: “Preamble is limiting.”
- c. *Court’s construction*: The entire preamble is not limiting. The terms “reaction” and “microfluidic systems” are limiting as previously construed.

These terms appear in asserted claims in the '407 and '193 patents. The only dispute with respect to this term is whether the preamble is limiting. Defendant wishes to construe the entire preamble so as to limit the method such that the reaction takes place “in the substrate.” Defendant argues that the preamble provides an antecedent basis for the claim terms “microfluidic system” and “reaction.” (D.I. 93 at 52-53). Defendant further argues that “the preambles specify where ‘the reaction’ must occur” and, therefore, the preamble is necessarily limiting. (*Id.* at 53) (emphasis omitted). While portions of a preamble may be limiting where those portions provide an antecedent basis for terms appearing in the body of the claim, it is inappropriate to construe an entire preamble as limiting if the rest of the preamble language is not limiting. *TomTom, Inc. v. Adolph*, 790 F.3d 1315, 1323 (Fed. Cir. 2015). Here, the preamble language states an intended use for the invention, “followed by the body of the claim, in which the claim limitations describing the invention are recited.” *Id.* at 1324. Furthermore, the invention as claimed is “structurally complete” without the remaining preamble language. *Id.* The claim elements are duplicative of the preamble in that it is clear that the reaction in question takes place “in the at least one plug.”

('193 patent, claim 1; '407 patent, claim 1). Nothing in the body of the claims further limits the location of the reaction. Therefore, I decline to construe the entire preamble or find that the entire preamble is limiting. I find that the preamble is limiting only to the extent that it provides an antecedent basis for the terms "microfluidic system" and "reaction," both of which I have already construed.

7. "a single target DNA or RNA molecule"

- a. *Plaintiffs' proposed construction*: "No construction necessary, but if construed 'a single DNA or RNA molecule of interest'"
- b. *Defendant's proposed construction*: "one target DNA or RNA molecule"
- c. *Court's construction*: "one and only one target DNA or RNA molecule"

This term appears in asserted claims in the '148 patent. With respect to Defendant's proposed construction, it is not clear to me how "one" is materially different from "a single." That being said, it seems to me that what Defendant is actually arguing is that the plugs may contain one and only one DNA or RNA molecule. (D.I. 93 at 70; Hr'g Tr. at 106:7-107:17). Defendant points to both the specification and prosecution history to support its argument. (D.I. 93 at 69-70, 72). Plaintiffs object that this construction effectively reads out the word "target." (*Id.* at 71).

I agree with Defendant. The specification makes clear in describing the possible concentrations of molecules in plugs that "the reagent concentration may be adjusted to be dilute enough that most of the plugs contain no more than a single molecule or particle." ('148 patent at 20: 15-17). The specification also indicates that, "The plug includes reagents sufficient for an autocatalytic reaction including a first species of molecule in a concentration such that the plug contains no more than a single molecule of the first species." (*Id.* art 2:58-61). The molecule "may be DNA or RNA." (*Id.* at 2:65-66). This, it seems to me, indicates that there may only be one DNA or RNA molecule in the plug. This reading is supported by the prosecution history. In

fact, an earlier version of claim 1 of the '148 patent specified that, "said subset of the plurality of plugs comprises a single biological molecule." (D.I. 95-3 at 287). The examiner rejected this claim under § 112, first paragraph, asserting that this portion of the claim was not adequately described in the specification. (*Id.* at 289). The applicant subsequently amended the phrase to read, "said plurality of plugs represents a Poisson distribution, and at least one member of said plurality comprises a single target DNA or RNA molecule." (*Id.* at 287). There is no evidence in the prosecution history as to why the applicant inserted the word "target" into the claim, but the applicant argued for allowance on the basis that the new language specifying that plugs "include[] a single DNA or RNA" is supported by the portion of the disclosure cited above. (*Id.*; *see also* '148 patent at 20: 15-17).¹ The word "target" also appears earlier in the claim in reference to the composition of the fluid: "a continuously flowing aqueous fluid comprising target DNA or RNA molecules." (*Id.* at claim 1). I think that this use of the word "target" is not inconsistent with plugs having a single DNA or RNA molecule. It seems clear from both the specification and prosecution history that the inventor intended "a single target DNA or RNA molecule" to mean that the plugs in question contained one and only one DNA or RNA molecule.

While I agree in principle with Defendant's interpretation of this claim term, Defendant's proposed construction does not provide any clarity on the issue of whether the plugs contain one and only one DNA or RNA molecule or in any way add anything useful to the existing claim language. Furthermore, I decline to adopt Plaintiffs' position on the meaning of "target" not only because it is unclear what is meant by "of interest," but also because allowing for the possibility of more than one DNA or RNA molecule in the plug is inconsistent with the intrinsic evidence. I

¹ The specification does not use the word "target" in connection with the method claimed in this patent. The word is used in a similar manner as in this claim, however, in the section on Crystallization. ('148 patent at 51:54-59; 51:64-52:3). I decline to opine on the meaning of "target" on its own at this time since the intrinsic evidence reveals that the meaning of "target" in this context is irrelevant to the construction of the phrase at issue.

will retain the word “target” in my construction, however, as it is used consistently throughout the claim to describe the DNA or RNA molecules that undergo reactions in the claimed method. Therefore, I construe this term to mean “one and only one target DNA or RNA molecule.”

8. “Poisson distribution”

- a. *Plaintiffs’ proposed construction*: “A distribution of objects where there is an equal and independent probability for each object to be distributed into any one of a number of partitions”
- b. *Defendant’s proposed construction*: “a distribution of target DNA or RNA molecules in plugs where there is an equal and independent probability for each target DNA or RNA molecule to be distributed into any one of a number of plugs”
- c. *Court’s construction*: “distribution of target DNA or RNA molecules in plugs where there is an equal and independent probability for each target DNA or RNA molecule to be distributed into any one of a number of plugs”

This term appears in asserted claims in the ’148 patent. Defendant would construe this term using references to the claim language, which Plaintiffs complain introduces unnecessary redundancy. (D.I. 93 at 72). As I noted at oral argument (Hr’g Tr. at 98:22-99:17), there does not seem to be an actual dispute as to the meaning of this term. Although Defendant’s proposed construction does introduce redundancy, it is also less abstract than Plaintiffs’ proposal. Therefore, I will adopt Defendant’s construction.

9. “non-fluorinated microchannel”

- a. *Plaintiffs’ proposed construction*: “A channel of a microfluidic device that has not been treated to include fluorine atoms at its surface”
- b. *Defendant’s proposed construction*: “a microchannel that does not include one or more fluorine atoms”
- c. *Court’s construction*: “microchannel that is not composed of a material that includes fluorine atoms or that is treated to include fluorine atoms at its surface (excluding the possible inclusion of impurities or contaminants)”

This term appears in asserted claims in the '083 patent. Plaintiffs argue that Defendant's proposed construction would encompass a microchannel that had an impurity or contaminant of even a single fluorine atom. (D.I. 93 at 73). Defendant complains that Plaintiffs' proposed construction would lead to the "nonsensical" result that a microchannel fabricated from a fluorinated polymer would be a non-fluorinated microchannel if it had not been treated. (*Id.* at 75). At oral argument, the parties agreed in principle that the presence of impurities would not create a fluorinated microchannel from an otherwise non-fluorinated microchannel, but the parties did not agree upon exact language. (Hr'g Tr. at 111:24-113-16). Therefore, I will construe this term to mean: "microchannel that is not composed of a material that includes fluorine atoms or that is treated to include fluorine atoms at its surface." Defendant is prohibited from arguing that fluorine impurities or contaminants render a non-fluorinated microchannel fluorinated.

10. "biological molecule"

- a. *Plaintiffs' proposed construction*: "Molecules such as DNA, RNA, carbohydrates, and sugars and variants thereof."
- b. *Defendant's proposed construction*: "naturally occurring molecules such as proteins, DNA, RNA, carbohydrates, and sugars"
- c. *Court's construction*: "molecules such as proteins, DNA, RNA, carbohydrates, and sugars"

This term appears in asserted claims in the '407 patent. The parties dispute whether a molecule must be "naturally occurring" in order to be a biological molecule. Defendant argues that the patent "distinguishes between 'biological' and 'synthetic small molecules' that are not naturally occurring." (D.I. 93 at 79). Defendant further urges that the patent "distinguishes between 'biological molecules,' which it defines as 'proteins, DNA, RNA, carbohydrates, sugars, etc.' and 'biomolecules.'" (*Id.* at 81). Defendant contends that biomolecules are not biological molecules. (*Id.* at 79). Plaintiffs counter that the patent expressly contemplates the use of

synthetically modified biological molecules. (*Id.* at 77). I agree with Plaintiffs. Nowhere in the specification or claims is there any mention of a requirement that biological molecules, as the term is used in the patent, be naturally occurring. As Plaintiffs point out, the express definition of protein, which Defendant recognizes as a biological molecule, specifies that a protein may be “naturally-occurring or man-made.” (’407 patent at 11:4-5). Defendant has not provided any citations to the intrinsic record or any extrinsic evidence to suggest that a person of ordinary skill would understand “biological molecule” as used in the patent to be restricted to only those biological molecules that happen to be naturally occurring.

Defendant further objects to Plaintiffs’ “open-ended list” of molecules. (D.I. 93 at 78). While such an open-ended list is not ideal, I doubt it would be possible to create a comprehensive list of biological molecules. Furthermore, the list Defendant objects to corresponds precisely with how the specification describes biological molecules. (’407 patent at 20:54-55). Therefore, I will construe “biological molecule” as “molecules such as proteins, DNA, RNA, carbohydrates, and sugars.” Defendant is prohibited from arguing that a biological molecule must be naturally occurring.

11. “thereby”

- a. *Plaintiffs’ proposed construction*: “No construction necessary.”
- b. *Defendant’s proposed construction*: “in order to”
- c. *Court’s construction*: “No construction necessary.”

This term appears in asserted claims in the ’430 patent. Defendant contends that its construction is necessary to clarify “that pressure adjustment occurs during the forming step *in order to* produce droplets of a target size. (D.I. 93 at 87) (emphasis in original). Plaintiffs counter that Defendant’s proposed construction suggests that the pressure is adjusted in order to form

droplets (*i.e.*, that droplets are not formed prior to the pressure adjustment). (*Id.* at 86). Defendant claims this is not the intent of its proposed construction, while also arguing that “the pressure adjustment step occurs *in order to* produce droplets.” (*Id.* at 88). I agree with Plaintiffs that no construction of this term is necessary. The specification makes clear that the pressure adjustment step is undertaken in order to alter the size of the droplets being formed, not to produce the droplets in the first place. (’430 patent at 5:23-28). Therefore, I find that no construction is necessary for this term and Defendant is prohibited from arguing that “thereby” means “in order to.”

12. “each”

- a. *Plaintiffs’ proposed construction*: “No construction necessary, but if construed, ‘each and every . . . of the method’”
- b. *Defendant’s proposed construction*: “each and every”
- c. *Court’s construction*: “no construction necessary”

This term appears in asserted claims in the ’091 and ’083 patents. Having considered the additional briefing submitted by the parties (D.I. 112), it seems to me that there is no real dispute as to the meaning of this term as it is used in the claims identified by the parties. Plaintiffs seek to introduce “of the method” into the construction of the terms, purportedly to prevent Defendant from arguing that “each” is construed to include plugs or plug-fluids other than those used in the claimed method. (D.I. 112 at 3). I think it is apparent from the claim language that the phrase “each plug-fluid” is not meant to include every plug-fluid in the Universe without expressly including such a limitation in the construction of this term. For example, claim 1 of the ’091 patent describes the use of “a first plug-fluid” and “a second plug-fluid.” The claim then specifies that “each plug-fluid is immiscible with the carrier-fluid.” I think it is clear from this language that “each plug-fluid” refers to the first and second plug-fluids listed earlier in the claim and not to every plug-fluid in existence. Therefore, I find that no construction is necessary, with the

understanding that “each” refers only to the plugs and plug-fluids in the claim at issue and not to plugs and plug-fluids generally.

IV. CONCLUSION

Within five days the parties shall submit a proposed order consistent with this Memorandum Opinion suitable for submission to the jury.